

REMARKS

Claims 1-7 and 9-19 are pending in the application. Claims 5, 12, and 13 have been cancelled by this amendment. Therefore, claims 1-4, 6, 7, 9-11, and 14-19 are at issue.

The present invention is directed (meth)acrylic esters of monoalkoxylated polyols and their use as a crosslinking agent for hydrogel-forming polymers, also termed superabsorbent polymers (SAPs). The claimed (meth)acrylic esters of monoalkoxylated polyols contain three to six (meth)acrylate groups and 1 to 100 alkoxy groups. The alkoxy groups can be ethoxy, propoxy, and/or butoxy. See claim 1.

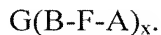
In preferred embodiments, the claimed compounds contain three or four (meth)acrylate groups and 2 to 50 alkoxy groups, i.e., ethoxy and/or propoxy (claim 2). In other preferred embodiments, the claimed compounds contain three (meth)acrylate groups and the alkoxy is ethoxy (claim 3). In yet other preferred embodiments, the polyol is glycerol (claims 4, 10, and 11).

The claimed (meth)acrylic esters of monoalkoxylated polyols are used as crosslinking agents in the preparation of an SAP (claims 6, 7, 9, and 14-16). SAPs crosslinked with a claimed (meth)acrylic ester of a monoalkoxylated polyol exhibit a reduced percent of extractable components and a reduced centrifuge retention capacity (CRC) compared to an SAP prepared from a crosslinking agent wherein each hydroxy group of the polyol is alkoxyated, e.g., SARTOMER[®] SR9035. See specification, Comparative Example and Examples 5 and 6, at page 30, line 31 through page 32, line 34. The data shows that a present (meth)acrylic ester of a monoalkoxylate polyol exhibits superior crosslinking properties. Applicants provide Exhibit A concurrently with this amendment showing that SARTOMER[®] SR9035 is based on an ethoxylated triol wherein *each* of the three hydroxy groups of the triol is ethoxylated.

Claims 1-4, 6, 7, 10, 11, and 14-16 stand rejected under 35 U.S.C. §103 as being obvious over Rodrigues U.S. Patent No. 5,335,726 ('726) in view of Hoy et al. U.S. Patent No. 4,581,470 ('470). The examiner contends that the present claims would have been obvious because of a combination of the protected polyol synthesis disclosed in the '470

patent and the teachings of the '726 patent directed to *poly*alkoxylated polyols. Applicants traverse this rejection.

With respect to compound claims 1-4, 10, and 11, each directed to (meth)acrylic esters of *mono*alkoxylated polyols, the '726 patent discloses a crosslinking agent having a formula:



In this formula, B is $(C_dH_{2d}O)_c$ and d is 2 or 3, i.e., oxyethylene or oxypropylene. In addition x is 2, 3, or 4. Accordingly, the crosslinking agent taught by the '726 patent is alkoxylated on *each* B-F-A group present in the compound, as opposed to a presently claimed monoalkoxylated polyol.

The examiner recognizes that the crosslinking agent of the '726 patent is alkoxylated at each hydroxy group of the polyol, as forth in fig. 1 at page 2 of the Office Action and as stated in the first sentence of page 3 of the Office Action. The examiner provides a definition for the variable "c" that is undefined in the '726 patent. Although the range of this definition is made without support, the examiner correctly notes that *each* "c" is one or greater, thereby requiring alkoxylation at each hydroxy group of the polyol. The '726 patent therefore teaches no more than the prior art, e.g., a polyol alkoxylated at each hydroxy group and capped with a (meth)acrylate groups, like SARTOMER[®] SR9035 utilized in the comparative example of the present invention and shown in Exhibit A.

The '726 patent therefore fails to teach or suggest a (meth)acrylic ester of a monoalkoxylated polyol of claims 1-4, 10, or 11, and fails to provide any reason or incentive for a person of ordinary skill in the art to modify the teachings of the '726 patent and arrive at the presently claimed compounds. The '470 patent does not overcome the deficiencies of the '726 patent.

The '470 patent teaches protecting two hydroxy groups of a triol, i.e., glycerol, then alkoxyating the remaining hydroxy group with an alkylene oxide, i.e., propylene oxide. The '470 patent, however, fails to teach or suggest reacting the resulting hydroxy groups with a (meth)acrylic acid to form a (meth)acrylate ester.

The '470 patent also discloses polymerizing an ethylenically unsaturated monomer *in situ* in the alkoxylated polyols of the '470 patent to provide a polymer/polyol. See '470 patent, column 11, line 67 through column 12, line 2. Contrary to the examiner's statements, the polyols of the '470 patent are *not* reacted with the ethylenically unsaturated monomers. The polyols of the '470 patent are used *merely* as a solvent for the *in situ* polymerization and *cannot* react under the free radical conditions taught in the '470 patent, e.g., see '470 patent, Example 71 at column 35.

The '470 patent goes on to state that the "polymer content of the polymer/polyol may vary" and that additional polyol can be added to reduce the polymer level as desired, further showing that the "polymer" and "polyol" are discrete entities. See '470 patent, column 12, lines 3-26, for example. The polyols of the '470 patent are utilized as a monomer in the formation of polyurethanes. The polyols of the '470 patent are not used to form (meth)acrylate esters, as claimed, and the reference provides no incentive or reason for a person skilled in the art to form (meth)acrylate esters from such polyols.

Prior to addressing the present rejections, the U.S. Supreme Court in *Graham v. John Deere Co.*, 148 U.S.P.Q. 459 (1966) held that non-obviousness under 35 USC §103 is determined by: (1) determining the scope and content of the prior art; (2) ascertaining the differences between the prior art and the claims at issue; (3) resolving the level of ordinary skill in the art; and, (4) inquiring as to any objective evidence of non-obviousness.

To establish a *prima facie* case of obviousness, the examiner must satisfy three requirements. First, as the U.S. Supreme Court very recently held in *KSR International Co. v. Teleflex Inc. et al.*, 127 S.Ct. 1727 (2007), "a court must ask whether the improvement is more than the predictable use of prior art elements according to their established functions. ...it [may] be necessary for a court to look to interrelated teachings of multiple patents; the effects of demands known to the design community or present in the marketplace; and the background knowledge possessed by a person having ordinary skill in the art, all in order to determine whether there was *an apparent reason* to combine the known elements in the fashion claimed by the patent at issue. ...it can be important to *identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements* in the way the claimed new invention does... because inventions in most, if not all, instances rely

upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known." (emphasis added, *KSR, supra*). Second, the proposed modification of the prior art must have had a reasonable expectation of success, determined from the vantage point of the skilled artisan at the time the invention was made. *Amgen Inc. v. Chugai Pharm. Co.*, 18 USPQ2d 1016, 1023 (Fed. Cir. 1991). Lastly, the prior art references must teach or suggest all the limitations of the claims. In *re Wilson*, 165 USPQ 494, 496 (C.C.P.A. 1970).

The '726 patent discloses (meth)acrylates of polyols wherein each hydroxy groups of the polyol has been alkoxyated. As stated by the examiner, the '726 patent *fails* to teach or suggest any monoalkoxyated polyols.

The '470 patent discloses monoalkoxyated polyols that can be used in the preparation of a polyurethane. However, the '470 patent fails to teach any (meth)acrylate of the disclosed polyols. The '470 patent teaches no more than monoalkoxyated polyols that can react with isocyanates to form a polyurethane or as a solvent in which ethylenically unsaturated monomers are polymerized.

The examiner contends that it would have been obvious to arrive at the present claimed (meth)acrylates of a monoalkoxyated glycol from a combination of the '726 and '470 patents. However, the combination of cited references provides no apparent reason for a person skilled in the art to make the jumps in reasoning needed to arrive at the presently claimed invention. The examiner apparently is relying solely upon a reasoning that the claimed compounds are obvious because the two cited references are both disclose alkoxyated polyols. The examiner however has failed to identify a reason that would have prompted a person of ordinary skill in the art to combine the references in the way the claimed invention does, per the decision in *KSR*.

More particularly, the Supreme Court recently identified a number of rationales that may be used to support a conclusion of obviousness, consistent with the framework set forth in its decision in *Graham v. John Deere Co.* See *KSR Int'l Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1739-40 (2007). These and other representative rationales are described at MPEP §2143 (8th Ed., Rev. 6, Sept. 2007). Regardless of the supporting

rationale the Patent Office must clearly articulate facts and reasons why the claimed invention "as a whole" would have been obvious to a person at ordinary skill in the art at least as of the claimed invention's effective filing date. See *KSR Int'l*, 127 S.Ct at 1741 (citing with approval *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006) ("[R]ejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness.")); see also MPEP §2143 ("The key to supporting any rejection under 35 USC §103 is the clear articulation of reason(s) why the claimed invention would have been obvious.").

The cited art provides no apparent reason to combine and alter the teachings of the cited references and arrive at the present invention. The '726 patent teaches (meth)acrylates of alkoxyated polyols wherein *each* hydroxy group of the polyol is alkoxyated. These compounds in the '726 patent are used as crosslinking agents, and the reference provides no reason for a person skilled in the art to alter the structure of these crosslinking agents because they perform well.

The '470 patent merely teaches a polyol wherein one of the hydroxy groups is alkoxyated. The '470 patent does not teach or remotely suggest alkoxyating these alkoxyated polyols, but teaches use of the polyols in reactions with isocyanates to form polyurethanes. Polyurethanes are not SAPs and are structurally and functionally different from SAP. The polyols of the '470 patent also are used as a solvent, and *not* a reactant as contended by the examiner, in a polymerization of ethylenically unsaturated polymers to provide polymer/polyols.

In fact, the '726 and '470 patents are directed to substantially different types of polymerizations, i.e., free radial polymerization and polyaddition, respectively. Thus, the references are directed to different technical fields. The '470 polyols are optimized for polyurethane formulation. To synthesize these polyols, two additional process steps are necessary. There is no apparent reason or motivation to add two process steps to the process of the '726 patent when no benefit is expected because of the different polymerization chemistry of the two references.

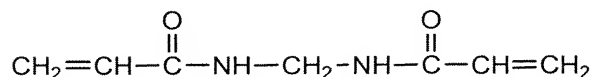
Even though the primary '726 reference provides no apparent reason to alter the structure of the crosslinking agents disclosed therein, if a person skilled in the art arguably should read the '470 patent and decide to cap the polyols thereof with (meth)acrylate groups, the results demonstrated by the present invention could not have been expected. Unpredictably, the (meth)acrylate esters of monoalkoxylated polyols of the present invention demonstrated a superior crosslinking ability over esters of polyols when more than one hydroxy group is alkoxylated. These unexpected results are demonstrated in the Comparative Example and Examples 5 and 6 of the specification, wherein the same molar amount of crosslinker is used and the centrifuge retention capacity (CRC) and the percent extractable components of a polymer prepared using a claimed (meth)acrylic ester are lower than polymers prepared using (meth)acrylic esters of polyols having more than one polyalkoxy chain. These results demonstrate an improved crosslinking density over (meth)acrylic esters of polyols having more than one polyalkoxy chain.

For all the reasons set forth above, it is submitted that claims 1-4, 10, and 11 would not have been obvious over a combination of the '726 and '470 patents, and that the rejection of these claims should be withdrawn.

With respect to claims 6, 7, and 14-16, directed to hydrogel forming polymers and their method of preparation, the cited '726 and '470 patents have been discussed above, as has the patentability of the (meth)acrylate esters of monoalkoxylated polyols used as a crosslinking agent for the claimed polymers. It is submitted that the polymers of claims 6, 7, and 14-16 are patentable for the same reasons that the crosslinking agent to prepare the polymers are patentable. In particular, the combination of references fails to provide an apparent reason or incentive to prepare an SAP using a compound of claim 1 as an internal crosslinking agent.

In addition, the examiner is incorrect in statements made to support the rejection. First, the '726 patent *fails* to teach or suggest monoalkoxylated polyols, as recognized by the examiner. The '726 teaches alkoxylated polyols wherein *each* hydroxy group has been alkoxylated.

The examiner's reliance upon column 10, Example II, lines 55-64 and Table II is misplaced. The crosslinking agent of Example II is methylene bisacrylamide (MBA), which is *not* an ester and is not alkoxyated at all, but having a structure



MBA is in no way related structurally to a claimed compound. In addition, the crosslinking agents listed in Table II are defined in Table I. Not one crosslinking agent listed in Table I is alkoxyated and each contains only *two* acrylate groups. These compounds also are substantially different in structures from the claimed compounds.

In addition, as discussed above, a polymer recited in the present claims exhibits unexpected results. In particular, a polymer crosslinked using a compound of claim 1 has a substantially reduced percent of extractable components and an improved CRC compared to a polymer prepared from a (meth)acrylate of a polyol wherein all three hydroxy groups are alkoxyated, which is the type of a crosslinking agents disclosed in the '726 patent.

For all the reasons set forth above, it is submitted that claims 6, 7, and 14-16 also would not have been obvious over a combination of the '726 and '470 patents, and that the rejection of these claims should be withdrawn.

Claims 5, 12, and 13 stand rejected under 35 U.S.C. §103 as being obvious over the '470 patent in view of Haussling et al. U.S. Patent No. 5,821,383 ('383). This rejection is now moot in view of the cancellation of claims 5, 12, and 13.

Claims 9 and 17-19 stand rejected under 35 U.S.C. §103 as being obvious over the '726 patent in view of the '470 patent and in further view of WO 93/21237 (WO '237). Applicants traverse this rejection.

The '726 and '470 patents have been discussed above, as has the patentability of the compounds and SAPs of claims 1, 6, and 14-16 over a combination of these references. WO '237 is relied upon for teaching a hygiene article containing an SAP crosslinked by acrylic acid esters of polyhydric hydrocarbons (e.g., glycerol). However, the crosslinking

agents of WO '237 contains two or more alkoxyated hydroxy groups, as shown in Formula I at page 3, lines 3-14 of WO '237. In fact, WO '237 discloses that a preferred crosslinking agent is identical to the crosslinking agent used in the comparative example of the present invention. See WO '237, page 18, lines 6-23, Fig. 1, and Fig. 2.

WO '237 therefore fails to teach or suggest a compound of claim 1 or a polymer of claim 6, wherein only one hydroxy group is alkoxyated. WO '237 therefore teaches no more than incorporating an SAP into a hygiene article, wherein the SAP is crosslinked with an alkoxyated (meth)acrylic ester of the type disclosed in the '726 patent and in the comparative example of the present application.

Accordingly, it is submitted that claims 9 and 17-19 are patentable over a combination of the '726 and '470 patents and WO '237 for the same reasons that claims 1, 6, and 14-16 are patentable over a combination of the '726 and '470 patents. No reference teaches a (meth)acrylic ester of a *mono*alkoxyated polyol. In addition, the references in combination fail to provide any incentive or apparent reason to prepare and use a claimed (meth)acrylic ester of a monoalkoxyated polyol. Furthermore, the claimed crosslinking agents provide polymers that exhibit unexpected benefits with respect to a reduced percentage of extractable components and reduced CRC, thereby providing an improved hygiene article.

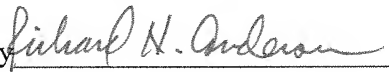
For all the reasons set forth above, it is submitted that claims 9 and 17-19 are patentable over a combination of the '726 patent, the '470 patent, and WO 93/21237, and that the rejection should be withdrawn.

In summary, all pending claims are in a condition for allowance. An early and favorable action on the merits is respectfully requested.

Should the examiner wish to discuss the foregoing, or any matter of form in an effort to advance this application toward allowance, the examiner is urged to telephone the undersigned at the indicated number.

Dated: April 30, 2008

Respectfully submitted,

By 

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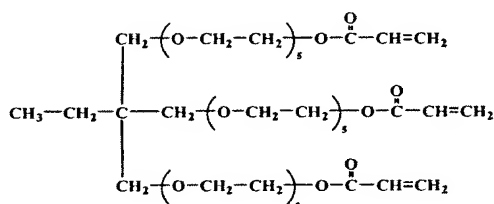


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product bulletin: SR-9035

ETHOXYLATED (15) TRIMETHYLOLPROPANE TRIACRYLATE



DESCRIPTION

SR-9035, 15-mole ethoxylated trimethylolpropane triacrylate, is a water soluble, low skin irritation monomer for use in free radical polymerization. SR-9035 yields flexible, low shrinkage films.

PRODUCT HIGHLIGHTS

Highly water soluble
Aqueous thickener
Low skin irritation

PERFORMANCE PROPERTIES

Chemical resistance
Flexibility
Adhesion
Abrasion resistance; impact resistance

SUGGESTED APPLICATIONS

Acrylics; paints; photopolymers, inks
Pressure sensitive, structural adhesives
Chemical Intermediates
Glass, metal, optical, wood coatings
Paper, PVC floor, release, textile coatings
Photoresists, solder mask electronics

SR-9035

TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

Functionality	3
Appearance	Clear liquid
Inhibitor, ppm.	475 MEHQ
Solvent, wt. %	0.1
Water, wt. %	0.2
Acid, wt. %	0.05
Color, APHA (G=Gardner scale)	60
Specific Gravity @ 25 °C	1.113
Viscosity, cps.	168 @ 25C
Refractive Index	1.4695
Surface Tension, dynes/cm.	41.5
Tg, °C	-32
Molecular Weight	956
Flash Point, °C	118 polymerization

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